

**Technology Development, Implementation and Assessment:
K - 16 Pre-service, In-service and Distance Learning Initiatives**

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I. Introduction

The technologies associated with distance learning are evolving rapidly, giving to educators a potential tool for enhancing the educational experiences of large numbers of students simultaneously. This enhancement, in order to be effective, must take into account the various agendas of teachers, administrators, state systems, and of course students. It must also make use of the latest research on effective pedagogy. This combination, effective pedagogy and robust information technology, is a powerful vehicle for communicating to a large audience of school children the excitement of mathematics and science--an excitement that for the most part is now well-hidden.

This project, "Technology Development, Implementation and Assessment," proposed to bring to bear on the education of learners in grades 3 - 8 in science and mathematics both advances in information technology and in effective pedagogy. Specifically, the project developed components in the NASA CONNECT video series--problem-based learning modules that focus on the scientific method and that incorporate problem-based learning scenarios tied to national mathematics and science standards. These videos serve two purposes; they engage students in the excitement of hands-on learning and they model for the teachers of these students the problem-based learning practices that are proving to be excellent ways to teach science and mathematics to school students. Another component of NASA CONNECT is the accompanying web-site. Using the internet technology, students and educators can participate in a follow-up lesson activity and learn additional information about the NASA researchers featured on the program. Finally, the project demonstrates that intensive presentation of the opportunities available in this video series leads to a large enrollment of students and teachers who profit from the series--well-produced science videos can attract an audience of significant size, driving the cost per student of the production of the programs well within reason for an expanded NASA role in the education of our nation's school children.

II. Major Accomplishments

There were three major accomplishments made by the project this year.

1. The production rate increased significantly. During the previous year three video programs were produced. This year the team created, scripted, taped, edited and produced five complete shows. This increase in productivity required an intensity of which we are proud.

2. The number of teachers and school children who watched the video programs increased dramatically. The NASA CONNECT registration in October 1998 was Educators 6,287 and Student 367,557. The number of registrations in May was 31,849 Educators and 2,060,904 Students. This data reflects a significant increase in viewers and is largely attributable to two factors--the success of the early three videos and the special efforts made by the principal investigator and members of the Office of Education at NASA-LaRC to spread the word about the quality and effectiveness of these programs.

3. The quality of the programs produced reached a high level. A direct and independent testimony to the quality of the programs is contained in the awards won by the programs. We list here these awards and at the same time express our appreciation to all the NASA personnel whose cooperation made the winning of these awards possible. NASA CONNECT won the following national awards for the 1998-99 series:

Telly Award, Winner 1999

Telly Award, Finalist 1999

Teleconference, 2nd Place, Best Distance Learning Program K-12

Society for Technical Communication, Award of Merit

Cinema In Industry Competition (CINDY) Award, Gold

III. Lessons

The improvements in the videos produced for the NASA CONNECT series most often come from feedback from users of the series. We learned three major lessons that made a great improvement in the effectiveness of the individual videos.

1. Last year each video contained a live portion. For each show Shelly Canwright, a member of the NASA Office of Education, would interview scientists or engineers and ask them questions sent in from those viewing the program. The low number of questions asked by students during each program indicated that this feature was not valuable; many schools were taping the show and re-broadcasting it at a locally convenient time, thus making asking questions in real time impossible. This year we have removed the "live" portion of the broadcast.

2. Teachers reported that it was sometimes hard to keep the students focused on the program for the entire thirty minutes. As a consequence, we created a series of questions for the students to answer while viewing the shows.

3. Again, we received valuable feedback from the teachers on the format of the lesson guide that we produced for each program. Teachers wanted fewer words and a more visual or

graphic presentation. We have therefore streamlined significantly the teachers' guides.

The CNU-NASA team now believes that it has developed a sound model for creating effective videos for school children to be used along with classroom activities that are available on the web. The importance of teacher feedback has been essential to the tuning process by which this model evolved.

IV. Continuing Impact

The CNU Technology Development Project has laid the groundwork for two significant follow-on activities. These two activities expand the range and reach of NASA resources. The first project continues the production and dissemination of the NASA CONNECT video series. Under this grant five new CONNECT videos will be made, and it is anticipated that these new thirty-minute programs will be viewed by over three million school children. The video series targets students in grades 4 - 8. CONNECT presents asynchronously career information and other features on its web site, <http://edu.larc.nasa.gov/connect/>, as well as the largely synchronous material of the videos.

The second project is called the NASA Why Files. It is a video/web-based program for elementary students in grades 3 - 5. The video, teacher guide and website will model how children use the scientific method to solve problems. It includes all of the important learning process skills-- gathering and classifying data, establishing hypotheses, designing experiments, identifying variables, and measuring, observing, predicting and communication results. The NASA-CNU team was one of seven teams selected nationwide from 171 proposals in the LEARNERS (Leading Educators to Applications, Research and NASA-related Educational Resources in Science) initiative of the NASA Education Division in cooperation with the learning Technology Project.